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AID FOR PHOTOGRAPHERS

It may be of interest to field workers to know that the second edition of Circular E-290, "Suggestions for the help of photographers at field stations of the Department of Agriculture," is now available and copies may be obtained through the usual channels.

INSECTS AFFECTING MAN AND ANIMALS

New headquarters for cattle-grub investigations.—The field headquarters for cattle-grub investigations have been moved to Ames, Iowa, and the laboratories formerly maintained at Galesburg, Ill., under the direction of R. W. Wells, and at Fargo, N. Dak., under the direction of W. G. Bruce, have been discontinued. The new field laboratory will be under the general direction of Mr. Wells. The move was made in order to facilitate research on the cattle-grub problem. At Ames the members of the staff will be in close touch with the scientists of the Iowa State College and Experiment Station and will have the advantage of adequate library facilities. The laboratory (at 325 Walnut Avenue), formerly a farm house on the outskirts of town, is supplemented by several acres of land, thus providing ample facilities for the care of animals for experimentation. The work in North Dakota has been largely for the purpose of determining the factors responsible for the comparative lack of cattle grubs in the valley of the Red River of the North. Mr. Bruce will continue investigations along the same line in eastern Colorado and other parts of the country. Mr. Wells has been conducting investigations of horse bots at Galesburg, in addition to the cattle-grub work, and will continue these studies at Ames. The personnel of the new laboratory also includes E. F. Knipling.

Eggs of horse botfly tested for viability.—Mr. Wells reports that "Eggs of Gastrophilus intestinalis DeG. were taken from five horses at Ames on November 26, to determine what percentage were still viable." It was found that from 28 to 70 per cent of the eggs had hatched; from 7 to 16.4 per cent were dead; from 19.16 to 62 per cent were alive; and from 1 to 8.33 per cent were uncertain. "* * * many of the viable eggs are only partially incubated, due possibly to the cold weather. It will be interesting to note how long and through what weather, on the host, viable eggs partially incubated, as well as those fully incubated, will survive."

Oviposition of mosquito *Culex quinquefasciatus* Say.--G. H. Bradley, Orlando, Fla., submits records which show "that of the substances tried, water containing manure is most attractive to ovipositing females of this mosquito. During November, of 1,349 egg boats laid in our largest test, 178, or 13.2 per cent, were laid on water containing hay infusion; 304, or 22.5 per cent, were laid on water containing rotting soy beans; 319, or 23.6 per cent, were laid on water containing commercial soy sauce; 38, or 2.82 per cent, were laid on clear water; and 510, or 37.9 per cent, were laid on water containing manure."

Mosquito control at Portland, Oreg.--H. H. Stage, Portland, Oreg., reports that "In cooperation with the City Park Bureau and the Civic Emergency Committee, the Mosquito Control Committee of the Portland Chamber of Commerce benefited in their control program when 40 acres of willow flat were cleared of dense brush. * * * the clearing of this dense jungle growth directly influenced the numbers of larvae hatching in the flooded areas, besides making the areas more accessible for oiling. It is in this area that we have captured *Aedes vexans* Meig. latest in the season, from 80 to 112 days after emergence."

Sulphur dips made more effective against goat lice.--O. G. Babcock, Sonora, Tex., reports that "the efficiency of the sulphur dips has been greatly increased, in fact doubled, by the addition of linseed oil soap and sodium phosphate. It is also shown that still better results are obtained by using the wettable sulphurs in combination with the linseed oil soap and sodium phosphate tribasic. Formerly five pounds of sulphur was considered the minimum quantity to use to obtain a kill, but by the addition of the above chemicals, 2 pounds of either the pure wettable sulphur or flotation sulphur dust is the minimum quantity per 100 gallons of water."

Deer show no ill effects of arsenic treatment for ticks.--"During the last two months," reports H. O. Schroeder, Brownsville, Tex., "I had an opportunity to examine a herd of 25 deer at frequent intervals. These deer were for a time staked out over areas accessible to cattle heavily infested with fever ticks. Ticks became quite numerous on some of the adult deer, the Australian variety far outnumbered *Boophilus annulatus* Say proper, the two forms appearing in about the same ratio as on the cattle. * * * The deer were freed from ticks in the regular arsenical bath under the supervision of a Bureau of Animal Industry inspector, as prescribed by the Bureau of Animal Industry for cattle. The deer suffered no apparent lasting ill effects from contact with the arsenic. This is of interest because this State is considering importation of deer from Mexico for breeding purposes and experiences of private individuals seemed to indicate that deer were too susceptible to arsenic poisoning to be freed from ticks in this manner."

Great gain in knowledge of blowfly parasites.--"The results of some of the systematic work with parasites have been received," reports D. C. Parman, Uvalde, Tex. "It has been found that we have at least four genera

and seven species of blowfly larval parasites in the United States, and they are all indicated to be of considerable economic value in control of blowflies. When the work was first started last year only one larval parasite with quite restricted distribution was known to parasitize blowflies in the United States."

STORED PRODUCT INSECTS

Commercial rearing of clothes-moth larvae--food requirements.--

During the past 10 years there has been a large and continuous demand for cultures of the webbing clothes moth (Tineola biselliella Hum.) for use by various commercial laboratories, particularly in connection with the testing of moth-proofing solutions. For some years past thousands of moth eggs and larvae were shipped from Germany to New York City for this purpose, and today one man in New Jersey raises and sells clothes-moth larvae to the trade. The experience of the Bureau early indicated that clean, pure wool fabrics are exceedingly poor food upon which to rear moth cultures. On such materials the mortality usually is 99 per cent or over. It was found that foods containing raw animal substances such as dead insects, dried blood, casein, fish meal, and uncleaned feathers and furs, served best as foods. Some of the best cultures ever noticed developed on grasshopper meal from South Africa. Wallace Colman, Takoma Park, Md., has discovered also that sprinkling woollen cloth or raw wool with dehydrated and pulverized brewers' yeast added a food substance that greatly accelerated the growth and reduced the mortality of moth larvae. In an experiment extending over a month, brought to a close in November, it was found that larvae fed on clean woollen cloth lost 43 per cent of their weight, as compared with a gain of 28 per cent for those fed on the same cloth to which yeast had been added. Similarly, larvae fed on raw wool gained 3 per cent in weight, as compared with a gain in the same period of 32 per cent for those fed upon raw wool to which yeast has been added.

Losses in figs reduced by shade cloths.--The work of Dwight F. Barnes in fig orchards and drying yards near Fresno, Calif., during the past season has just been summarized by Perez Simmons, who estimates that during the past season fig growers lost about \$216,000 in actual cash, mostly as a result of deductions because of infestations by the raisin moth (Ephestia figulilella Greg.). It is believed that a large part of this loss can be prevented by the use of shade cloths in drying yards. These cloths have never been experimented with in the dried-fruit establishments previous to this year. Mr. Barnes's tabulated data indicate a steady and rapid increase in infestation in the fruit left exposed in drying yards where it was handled in accordance with the usual custom of the dried-fruit industry, whereas the infestation of fruit exposed in the same yards but kept under shade cloth remained practically nil. At the end of a period of six weeks, the infestation by Ephestia larvae was found to be about 40 times greater on the fruit dried by the usual method. The Dried Fruit Association of California has invited Messrs. Simmons

and Barnes to discuss the dollars and cents value of these data at the Association's annual meeting to be held at Del Monte on January 13.

Pea weevil attacks all varieties of peas.--A. O. Larson, Corvallis, Oreg., reports that "Part of the time has been occupied in counting the number of weevil (Bruchus pisorum L.) stings in 73 varieties and strains of peas grown on the Oregon Experiment Station plots. * * * Some peas had as many as 17 entrance holes and one lot had 853 entrance holes in 100 peas. All here heavily infested; 35 of these varieties and strains have been examined from the crops of 1930, 1931, and 1932. * * * These peas were grown in adjoining plots each year and were exposed to pea weevil attack as uniformly as possible. Although all varieties were not uniformly attacked in any year, there seems to have been no consistent choice each year."

Early planted border of peas may aid in weevil control.--Tom Brindley, Moscow, Idaho, has made a study of the early planted border as a possible means of controlling the pea weevil. He was aided by an interested grower who planted borders 10 feet wide about his pea fields "just as soon as the ground was sufficiently dry. * * * Sweepings (of both the borders and the main field) were made with a 15-inch collecting net at 150-foot intervals; 100 consecutive sweeps being made between each 15-foot interval. * * * The dry peas for weevil examination were collected at the same intervals." Results of this experiment gave proof that "an early planted border attracts the weevils in large numbers and holds them on the border until the main field begins to bloom. After the main field starts blooming the weevils move from the border into the main field. * * *" Mr. Brindley concludes that "Even though the borders as planted this year were not a success as far as control was concerned, they opened up a number of possibilities that might lead to control measures. The methods that seem to offer the greatest possibility of control are (1) burning the borders when the peak of population is reached, and (2) dusting with calcium arsenate."

Ability of flour-mill insects to pass through milling rolls.--George B. Wagner, Kansas City, Mo., has been making an effort "to determine the possibility of the different stages of Tribolium sp. to pass through the rolls during the milling process. Two one-half gallon jars of mill stock were collected from each of 20 streams immediately after passing through the rolls. These were removed to the laboratory and heavily infested with species of Tribolium (adults, pupae, and larvae). After allowing the insects to pursue their normal life activities for 28 days, they were taken to an experimental mill and allowed to go through the roll for which they would have been intended had they not been collected below the preceding roll. The samples were again brought back to the laboratory and allowed to stand under optimum conditions for 28 days. Results indicate that the live adults may pass through the first 3 breaks; larvae may pass through the 4th, 5th, 6th, tailings, sizings, and some of the middlings rolls; and the eggs may pass through the entire series of rolls, even down to the low-grade roll."

sulphate with lime-sulphur undoubtedly results in the formation of iron sulphide. The trees sprayed with it have the appearance of being dipped in ink; but after a day or so all the black color disappears because the iron sulphide has changed to iron oxide. Even where the chemical analysis showed that there was little or no sulphur left on the trees, the rust mites did not come back as they did on trees sprayed with lime-sulphur solution alone. No injury occurred to the trees and no significant changes in the composition of the fruit have been detected.

Fruit moth parasite record from Japan.--G. J. Haeussler, who is engaged in obtaining parasites of the oriental fruit moth in Japan, summarizes last season's records of the parasitization of twig-infested larvae. He has found the greatest percentage of parasitization in Chosen, the next greatest in the southern islands of Kyushu and Shikoku, and the least in Hondo, the central island of Japan. The data obtained are as follows:

| Locality | Larvae collected | Parasitization |
|---------------------|------------------|----------------|
| | Number | Per cent |
| Hondo Island..... | 30,463 | 6.8 |
| Shikoku Island..... | 2,814 | 21.2 |
| Kyushu Island..... | 5,144 | 49.6 |
| Chosen (Korea)..... | 4,970 | 53.9 |

Bait trapping of the oriental fruit moth.--The three outstanding baits used in large-scale bait-trapping of the oriental fruit moth at Cornelia, Ga., in 1932, according to W. P. Yetter, jr., and L. F. Steiner, were: "Oil of anise 1/4 cc per trap in 10 per cent No. 3 remelt sugar; ethyl cinnamate 1/8 cc per trap in 10 per cent No. 3 remelt sugar; terpenyl acetate 1/2 cc per trap in 10 per cent medium soft sugar. The oil of anise bait averaged 50.1 moths per trap during the season; the ethyl cinnamate averaged 37.6 moths; and the terpenyl acetate, 35.0 moths. Check No. 1 averaged 27.4 moths per trap during the season and Check No. 2, 20.4 moths. At 1932 prices of aromatics, sugar, and saponin the oil of anise bait cost \$2.67 per 100 gallons, the ethyl cinnamate, \$2.76, and the terpenyl acetate, \$3.26. The 2,200 experimental traps caught 37,614 moths in 1932, whereas 2,400 traps in this same area in 1931 caught approximately 18,500."

Paradichlorobenzene dissolved in kerosene or in gasoline injurious to peach trees.--Oliver I. Snapp and J. R. Thomson, of the Fort Valley, Ga., laboratory, report experiments in which peach trees infested with the lesser peach borer (Aegeria pictipes G. and R.) were painted with paradichlorobenzene dissolved in kerosene, and other trees were painted with the same chemical dissolved in gasoline. While a complete kill of borers resulted, many of the trees were severely injured. In the same series of experiments emulsified asphalt was applied. This material proved to be valueless in borer control.

TRUCK CROP AND GARDEN INSECTS

Fire ants feed on poisoned vegetable weevils.--M. M. High, Gulfport, Miss., reports that "Early in the season fire ants (Solenopsis geminata Fab.) were found attacking dead weevils (Listroderes obliquus Gyll.) in the field that had been treated with arsenicals, but have not been found attacking active weevils."

Mole crickets survive fast of 63 days.--Reporting on the food habits of mole crickets, W. A. Thomas, Chadbourn, N. C., says, "Mole crickets (Gryllotalpa sp.) caged on moist sand without food have continued active for as long as 63 days. There is no noticeable growth during this period, but a gradual shrinking of the body, especially in the abdominal region."

Feeding honey to adults of a wireworm increases egg production.--C. E. Woodworth, Walla Walla, Wash., who previously noted that the feeding of pollen to females of Pheletes canus Lec. increased egg production, now reports that "In a more critical series of experiments run recently in which washed pollen and pollen-free honey were used instead of the pollen taken directly from the honey comb, it was found that the honey was the important factor that increased the egg production, although a mixture of pollen and honey was a little better than honey alone. Mold growing on pollen had a definite detrimental effect of about 25 per cent on the survival of egg-laying females in the breeding cages. Washed pollen was found to be little, if any, better than no food at all, but honey was considerably better, whether alone or mixed with washed pollen."

Wireworms become "hysterical."--"Some very interesting observations have been made regarding the reactions of the larvae (of Pheletes californicus Mann.) under the influence of minute concentrations of various fumigants," reports R. S. Lehman, Walla Walla. "The action of the larvae under the influence of chloropicrin is especially interesting. The gas seems to affect their nervous systems, as they are able to twist and roll but are unable to walk; although their legs do not appear to be paralyzed, they seem to have no control over them. One and one-half months after exposure to chloropicrin some of the larvae are still alive but not normal. They do not feed and are unable to walk. They twist and roll and appear 'hysterical,' if one may describe it as such."

Influence of temperature on survival of submerged wireworm larvae.--In a summary of results obtained in 1932 "on larval submergence at constant temperatures for certain definite periods of time," E. W. Jones, Walla Walla, reports that "Twenty larvae (of P. canus); placed individually in vials of tap water, were held at each constant temperature. The water was changed at weekly intervals. The experiments started on November 12, 1931, and were stopped on November 22, 1932." At a temperature of 86° F. the submerged larvae lived 2 months; at 81.5° F., 3½ months; at 68° F., 4¾ months; and at 54.5° and 50.0° F., practically no mortality occurred. It was also found that "Larvae of an approximate age of

1 year are less resistant than the older larvae by a period of $1\frac{1}{2}$ months. Newly hatched larvae are the least resistant of all stages."

Life history of *P. californicus* Mann.--M. W. Stone, Alhambra, Calif., submits a summary of life-history studies of this wireworm, in which the larvae were reared in salve cans at basement temperature. He states that "82 of 100 larvae that hatched during the period March 30 to April 5, 1931, inclusive, have completed their development; 3 pupated in 1931 for a one-year cycle and the remaining 79 in 1932 for a two-year cycle." The mortality in 1931 was 7 per cent and in 1932, 6 per cent; 5 per cent continuing as larvae to 1933. "It is interesting to note that for the two-year group the average number of wheat kernels eaten by the males was 145.5, over an average larval period of 523.6 days; the females averaged 153.3 kernels, over an average larval period of 531.7 days; * * * Of 250 larvae which hatched between March 30 and April 26, 1931, 47 completed development in 1931, and 163 this fall (1932) * * * Those completing development in 1931 were fed an average of 7.8 kernels monthly, whereas those pupating in 1932 were fed an average of 10.3 kernels monthly from the time of hatching until pupation." In this experiment 18.8 per cent completed development in 1931 and 65.2 per cent in 1932; the mortality in 1931 was 5.2 per cent; in 1932, 5.6 per cent; and 5.2 per cent continued as larvae to 1933. Of 368 larvae hatched during the period May 8 to May 22, 1930, inclusive, 201, or 54.6 per cent, completed development in 1931 for a two-year cycle, whereas 94, or 25.5 per cent, completed development in 1932 for a three-year cycle; the mortality in 1930 and 1931 was 15.76 per cent and in 1932, 1.08 per cent; 2.98 per cent continued as larvae to 1933. "An average of 10.4 kernels of wheat per month were fed the larvae for the 487.2-day (or 16.24-month) period * * * The 94 individuals in the three-year cycle were fed an average of 11 kernels monthly for the 28.12-month period."

Life history of *Melanotus variolatus* Lec.--Mr. Stone also reports that "Of 30 larvae of *M. variolatus* that hatched during the period June 2 to 27, 1931, inclusive, from eggs deposited between May 1 and June 1, 1931, inclusive, 22, or 73.3 per cent, completed development in 1932; 8, or 26.6 per cent, died during the experiment. This group of larvae consumed an average of 10.9 kernels monthly."

FOREST INSECTS

Importations of parasites in 1932.--T. H. Jones, of the gipsy moth laboratory, Melrose Highlands, Mass., submits a detailed summary of parasite material received during 1932: Parasites of the gipsy moth from European countries included 7,106 Hymenoptera (as cocoons and adults) and 42,795 tachinid puparia. As parasites of the brown-tail moth, 438 puparia of 7 species of tachinids were received. Satin moth parasites included 5,762 braconids in cocoons and 2,257 tachinids in puparia. Of the birch sawfly leaf miner, 28,587 mines and hibernation cells and 9,748 mines containing chalcids, 37 mines containing ichneumonines, and 1,398 cocoons of *Phanomeris phyllotomae* Mues. were received from

Austria. Parasites of the European pine shoot moth received from Austria included host material and various stages of 10,307 Hymenoptera and 3,023 tachinids, also cultures of a fungus, Beauveria bassiana (Bals.) Vuill. Larval cases of the larch case bearer that yielded 4,330 Hymenoptera were received from Austria. From host material of the oriental moth received from Chosen and Japan, 588 hymenopterous parasites issued. Host material of the elm leaf beetle from which 22,385 adults of Tetrastichus spp. issued, and 51,790 adults of this beetle, supposedly parasitized by the tachinid Erynnia nitida R. D., were also received from Europe, as were 196 larvae, pupae, and adults of a predacious beetle, Lebia sp.

Lethal dose of lead arsenate for gipsy and satin moths.--S. F. Potts, Melrose Highlands, reports that "The minimum lethal dose for the gipsy moth is tentatively set at .08, .10, .12, .15, .18, and .23 milligram of lead arsenate per gram of larvae for the first, second, third, fourth, fifth, and sixth instars, respectively. The minimum lethal dose for the satin moth is tentatively set at .23 and .26 milligram per gram of larvae for the sixth and seventh instars, respectively. It is of interest that the satin moth larvae voided a much greater percentage of the arsenical eaten than did those of the gipsy moth. When fed a nonfatal arsenical dosage as larvae, the moths from the same contain a large portion of the arsenic retained by the larvae. Another portion is found in the pupal skin and shell, and a very small portion in the larval cast skins."

Studies of chalcid parasites of birch sawfly.--W. F. Sellers, Budapest, Hungary, reports that several species of small chalcids, whose parasitization of the birch sawfly leaf miner has been from 10 to 41.81 per cent, "kill the larvae before the damage to the individual leaves has progressed very far, therefore they would seem to be of the most value from an economic standpoint."

Bird predator on birch sawfly identified.--Mr. Sellers also states that "a bird that removed Phyllotoma larvae from their mines has been determined as Pyrrohula europaea Vieill. The bird was active in the Phyllotoma infestations about the middle of September. Leaves from which larvae had been removed had holes pierced through both sides of the Phyllotoma mine, or pieces removed at the margin of the mine."

Lead arsenate stunts growth of pine seedlings.--R. A. St. George, Asheville, N. C., reports that "Results of cooperative experiments * * * for the control of white grubs in forest nursery seed beds indicate that dosages of 1,500 pounds or more of lead arsenate per acre cause a marked stunting of the growth of young pines. Such growth is checked from 40 to 50 per cent, depending on the quantity of lead arsenate used in the preparation of the beds. The treated beds were almost entirely free from grub injury whereas adjacent check plots were damaged considerably."

Forest fires increase bark-beetle menace.--K. A. Salman, Berkeley, Calif., reports that "Final analysis of the Sugar Hill Burn study on the Modoc National Forest was completed during the month (November). This fire, which occurred in July, 1929, apparently had no influence on tree growth of that year. Growth in 1930 was depressed below the normal, and recovery after 1930 was slower in the fire-injured trees than in those outside the burn. Conclusions show (1) that in ponderosa pine the trees most heavily defoliated by fire are the most susceptible to attack by bark beetles and other cambium insects; (2) that susceptibility is increased in trees suffering from cambium injury in addition to foliage injury; (3) that where salvage operations are considered, following a fire, the highest risk to surviving trees is where more than 50 per cent of the crown has been killed by the fire, and that these should be salvaged along with dead timber if possible."

CEREAL AND FORAGE INSECTS

Drought and close grazing reduce range caterpillar.--In a report on his recent trip to the range caterpillar territory in northeastern New Mexico, O. L. Barnes, Tempe, Ariz., says: "Range conditions were poor over practically all the area observed, due principally to lack of rainfall during the summer and early fall. * * * The entire range caterpillar area visited had been very closely grazed, grasses or other plants suitable for egg deposition were very scarce in many localities, and apparently the larvae of the range caterpillar (Hemileuca oliviae Ckll.) had died in large numbers over a considerable portion of the area visited. * * * Range caterpillar eggs could be found after a brief search at almost any point in the caterpillar territory, but eggs in concentrated quantities suitable for mass collecting were observed in only three general localities--near Greenville, in Union County; Mills, in Harding County; and Wagon Mound, in Mora County. Grama and other grasses were rather abundant and weather conditions had been more suitable in these areas. By far the best collecting area of all was located about four miles south of Wagon Mound. It was estimated at the laboratory that approximately 8,000,000 range caterpillar eggs were collected this season (for breeding the parasite Anastatus semiflavus Gahan)."

Longevity of adult alfalfa seed chalcid in relation to food.--L. L. Stitt, Tempe, reporting on longevity studies of Bruchophagus funebris How., says: "The longest life of any individual was 106 days--a female in the constant temperature room where the average temperature was 76° F. and the food consisted of a honey-water solution. * * * In one series where the B. funebris received no food the maximum length of life was 5 days for females and 4 for males. In another series where they received honey-water for food the maximum length of life for the females was 77 days and for the males 19 days. The series kept in the constant temperature room and given honey-water for food gave a maximum length of life of 106 days for the females and 77 days for the males. In the series

where the B. funebris received honey-water for food their average length of life in May was 29 days for the females and 14.2 days for the males, as compared with 18.6 days for the females and 7.9 days for the males in July. The mean temperature for May was 71° F. and for July 87° F."

Effectiveness of grasshopper-bait ingredients.---According to J. R. Parker, Bozeman, Mont., "Amyl acetate and cane molasses, when used alone in poisoned bran largely, increased mortality from 5 to 10 per cent. Early in the season amyl acetate used with cane molasses seemed to add to the attractiveness of the bait. Cane molasses was about 6 per cent better than beet molasses * * * Beet molasses can be used in areas where it is produced. There was no significant difference between sodium fluosilicate and the arsenics (crude and sodium arsenite). Sodium fluosilicate seemed to act more quickly but the total mortalities were in favor of the arsenicals."

Parasitization of the wheat joint worm in Oregon.---In November T. R. Chamberlin, Forest Grove, Oreg., made an examination of the fall collection of wheat stubble from the sample farm in the Molalla district and reports the following condition: Harmolita present, 28.2 per cent; Ditropinotus aureoviridis Cwfd., 20.3 per cent; Eurytoma parva (Girault) Phillips, 48.2 per cent; Eupelmus allynii (French) and Eupelminus saltator Lind., 1.8 per cent; Calosota metallica Gah., 0.5 per cent; undetermined parasites, 1 per cent; total parasitization, 71.8 per cent. * * * examinations showed that 78 other Eurytoma had been destroyed by secondaries as follows: Ditropinotus, 56; E. allynii and E. saltator, 15; Calosota, 4; undetermined parasites, 3. The original parasitization of Eurytoma in the cells as counted in the fall was thus 52.9 per cent. It was also found that 118 other Harmolita had been destroyed by Eurytoma larvae which had entered more than one cell. The number of Harmolita originally present was, therefore, greater by 118 than was indicated by the fall count and the total destruction of Harmolita by Eurytoma was 56.1 per cent and by all parasites was 73.1 per cent. * * * Comparing the parasitization in the fall collection from the sample field in 1932 with that in the corresponding collection in 1931, the total destruction of Harmolita by E. parva has increased from 45.2 to 56.1 per cent. * * * By the middle of the month most of the H. tritici were still prepupae, whereas in 1931 practically all had pupated by the first of the month."

Oviposition of the wheat sheath joint worm as it affects the plant.---W. J. Phillips, Charlottesville, Va., reports that "Of the three species of Harmolita infesting wheat, vaginicola, where present, is usually the most conspicuous, although it is nearly always the least abundant. * * * As H. vaginicola forms galls in the sheath of the upper leaf which constrict and impede the development of the wheat head, the primary objective of our study was to contrast its egg-laying habits with those of H. tritici, the gall of which is formed in the stem and may occur at any of the nodes in the plant, depending on the stage of nodal development at the

time of oviposition. A study of microtome sections of galls reveals that vaginicola, like tritici, places its eggs in the vascular bundle, but always in the upper node. At the time the eggs are laid the tissues in which they are placed have not differentiated from the main stem. The developing embryonic head is at that time a millimeter or two above the joint where the eggs are placed. The sheath differentiates from the stem shortly after the eggs are laid and hypertrophied tissue appears about the egg within a day of its presence. In a normal leaf the sheath, after becoming differentiated from the stem, appears as a collar around the main stem, which eventually splits. The developing gall prevents the normal splitting of the sheath to the node, leaving a collar around the stem which constricts the developing head. Many of these heads never issue from the leaf sheath. The fact that oviposition by H. vaginicola is limited to the upper leaf sheath and requires the plants to be in a definite stage of development, a stage in which the plant remains for only a very short period of time, is undoubtedly responsible for the fact that the species never becomes very abundant."

COTTON INSECTS

Cotton yields increased by calcium-arsenate treatment.--H. C. Young, Eufaula, Okla., submits a detailed report on crop production in relation to molasses mixture, calcium arsenate, or combinations of these. The following results are culled from his report, the per acre cost and the gain per acre in pounds being indicated:

Arsenical treatment with one presquare application of molasses:

| | | | | |
|------------|-------------------|--------------------|----------|------------|
| 10 plats-- | 7.75 applications | calcium arsenate-- | \$3.71-- | 560 pounds |
| 4 plats-- | 7.0 applications | calcium arsenate-- | \$3.50-- | 439 pounds |
| 2 plats-- | 10.5 applications | calcium arsenate-- | \$5.25-- | 619 pounds |
| 2 plats-- | 5.5 applications | calcium arsenate-- | \$2.80-- | 507 pounds |

Treatments with molasses only:

| | | | |
|-----------|------------------------------------|----------|------------|
| 4 plats-- | 7.75 applications, weekly-- | \$2.81-- | 123 pounds |
| 2 plats-- | same, weekly for season -- | \$3.02-- | 129 pounds |
| 2 plats-- | same at 3-day or 4-day intervals-- | \$5.06-- | 252 pounds |
| 2 plats-- | 4.5 applications only-- | \$1.73-- | 213 pounds |

The value of the presquare applications of molasses, when followed by arsenical treatments, was shown in 4 plats by a gain of 57 pounds per acre with a cost of \$0.30 per acre.

Field cricket has many molts.--"The exact determination of the number of molts of this cricket (Gryllus assimilis Fab.) has been a difficult matter," states J. W. Folsom, Tallulah, La., "owing to the fact that the cricket almost always eats its cast skin. Beginning July 15, therefore, each of the crickets was marked (with the assistance of P. A. Woke and P. M. Gilmer) with a minute spot of aluminum paint on the pro-

notum. The disappearance of this spot indicated that a molt had occurred. The paint does not harm the cricket. Using this method, the molts of 64 nymphs were studied. The number of molts proved to be surprisingly large. Most of the nymphs have molted 8 times; the others, 7 times; and none have yet become adults. All these nymphs have been sheltered from the cold, and will be observed at intervals throughout the winter, during warm spells."

Flight-screen catches of boll weevils.--G. L. Smith, J. C. Clark, and A. L. Scales report: "The total number of weevils taken from screen traps by the month for this season is as follows: June, 135; July, 1,331; August, 2,654; September, 1,824; October, 1,258; and November, 2,630. The largest numbers were taken in August during the field migration and in November when the weevils were migrating from the fields to hibernation quarters."